UEN008: Energy and Environment

UEN008: Course Objectives

Course Objectives: The exposure to this course would facilitate the students in understanding the terms, definitions and scope of environmental and energy issues pertaining to current global scenario; understanding the need of sustainability in addressing the current environmental & energy challenges.

Introduction: Concept of sustainability and sustainable use of natural resources, Climate Change & its related aspects

Air Pollution: Origin, Sources and effects of air pollution; Primary and secondary meteorological parameters; wind roses; Atmospheric stability; Source reduction and Air Pollution Control Devices for particulates and gaseous pollutants in stationary sources.

Water Pollution: Origin, Sources of water pollution, Category of water pollutants, Physicochemical characteristics, Components of wastewater treatment systems.

UEN008: Course Contents

Solid waste management: Introduction to solid waste management, Sources, characteristics of municipal solid waste, Solid waste management methods: Incineration, composting, landfilling.

Energy Resources: Classification of Energy Resources; Non-conventional energy resourcesBiomass energy, Thermo-chemical conversion and biochemical conversion route; Solar energy-active and passive solar energy absorption systems; Type of collectors; Thermal and photo conversion applications.

Course Learning Outcomes (CLOs): On the completion of course, students will be able to:

1. Comprehend the interdisciplinary context of environmental issues with reference to sustainability .
2. Assess the impact of anthropogenic activities on the various elements of environment and apply suitable techniques to mitigate their impact.
3. Demonstrate the application of technology in real time assessment and control of pollutants.
4. Correlate environmental concerns with the conventional energy sources associated and assess the uses and limitations of non-conventional energy technologies

Recommended Books

1. *Moaveni, S., Energy, Environment and Sustainability, Cengage (2018)*
2. *Rajagopalan, R., Environmental Studies, Oxford University Press (2018)*
3. *O'Callagan, P.W., Energy Management, McGraw Hill Book Co. Ltd. (1993).*
4. *Peavy H.S., Rowe D.S., and Tchobanoglous, G. (2013) Environmental Engineering, McGraw Hill.*
5. *Rao, M.N. and Rao, H.V.N. (2014) Air Pollution, McGraw Hill.*
6. *Metcalf and Eddy. (2003) Wastewater Engineering: Treatment and Reuse, Fourth Edition, McGraw Hill.*
7. *Rai, G.D. (2014) Non-conventional Energy Resources, Khanna Publishers.*

Evaluation Scheme:

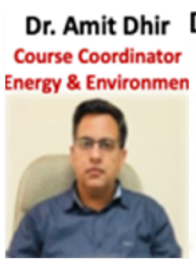
S.No.	Evaluation Elements	Weightage(%)
1	MST	35
2	EST	35
3	Sessional/Quizzes/Project Evualation	30

Course Blow up

S.No.	Topic & its contents	No. of Lectures/ weeks
1.	**Introduction:** Concept of sustainability and sustainable use of natural resources, Climate Change & its related aspects	02 (01 Week)
2.	**Air Pollution:** Origin, Sources and effects of air pollution; Primary and secondary meteorological parameters; wind roses; Atmospheric stability; Source reduction and Air Pollution Control Devices for particulates and gaseous pollutants in stationary sources.	06 (03 Weeks)
3.	**Water Pollution:** Origin, Sources of water pollution, Category of water pollutants, Physicochemical characteristics, Components of wastewater treatment systems.	06 (03 Weeks)
4.	**Solid waste management:** Introduction to solid waste management, Sources, characteristics of municipal solid waste, Solid waste management methods: Incineration, composting, landfilling.	04 (02 Weeks)
5.	**Energy Resources:** Classification of Energy Resources; Non-conventional energy resources- Biomass energy, Thermo-chemical conversion and biochemical conversion route; Solar energy-active and passive solar energy absorption systems; Type of collectors; Thermal and photo conversion applications.	08 (04 Weeks)

Path Forward…

A Series of lectures by various teachers who will take you on a journey through diverse aspects of *Energy and Environment*



STILL ONLY ONE EARTH

Over-exploitation of natural resources compromises the availability and fair distribution of resources and their associated benefits to the health of ecosystems and the livelihoods and wellbeing of people.

Importance of Energy and Environment Course

Sustainability

Sustainable Development

SUSTAINABLE = SUSTAIN + ABLE

Ability to Sustain

What – Who – How Long

Sustainable Development:

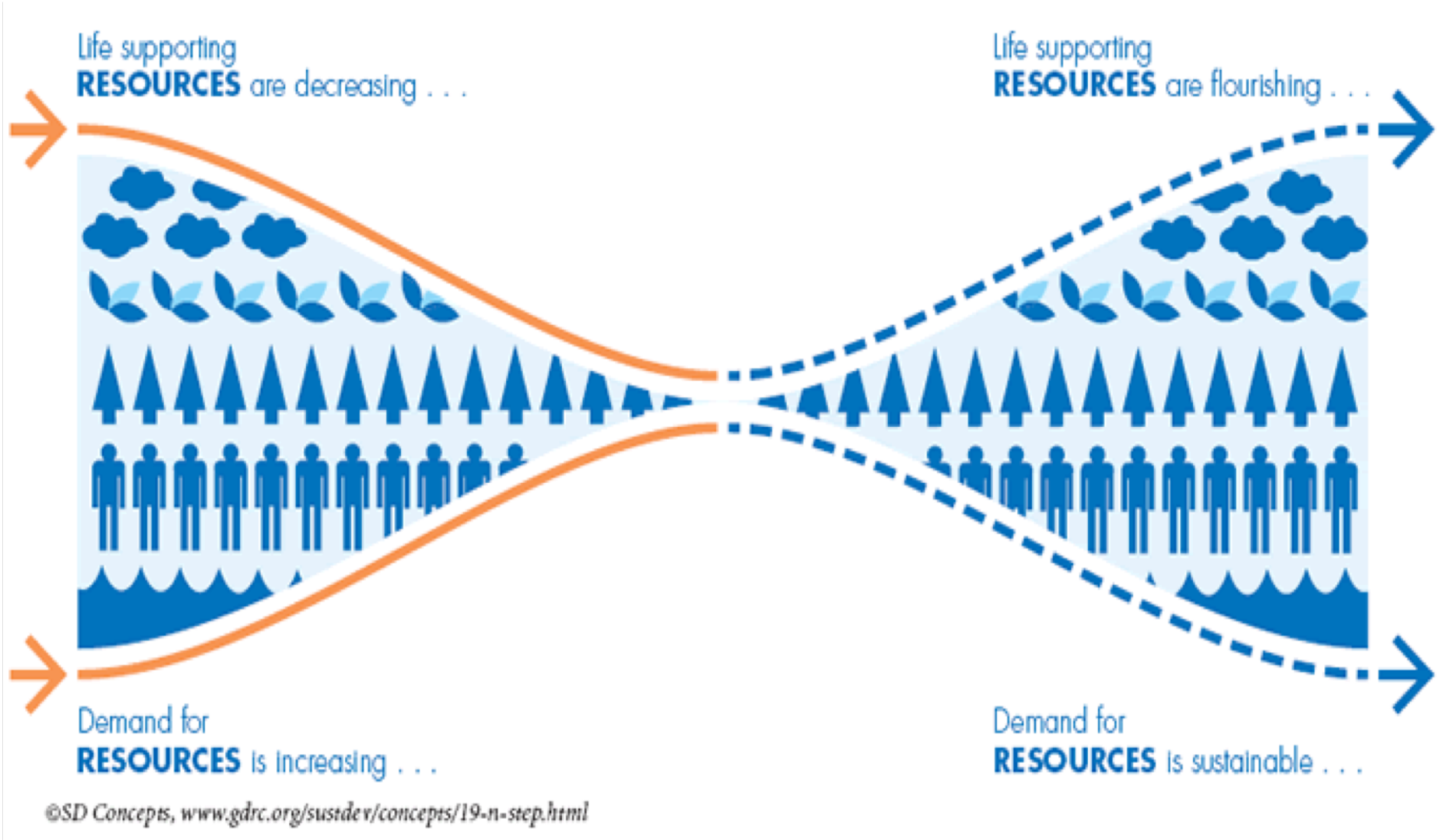
meeting the needs of the present without compromising the ability of future generations to meet their own needs.

— World Commission on Environment and Development (1987): *Our Common Future*

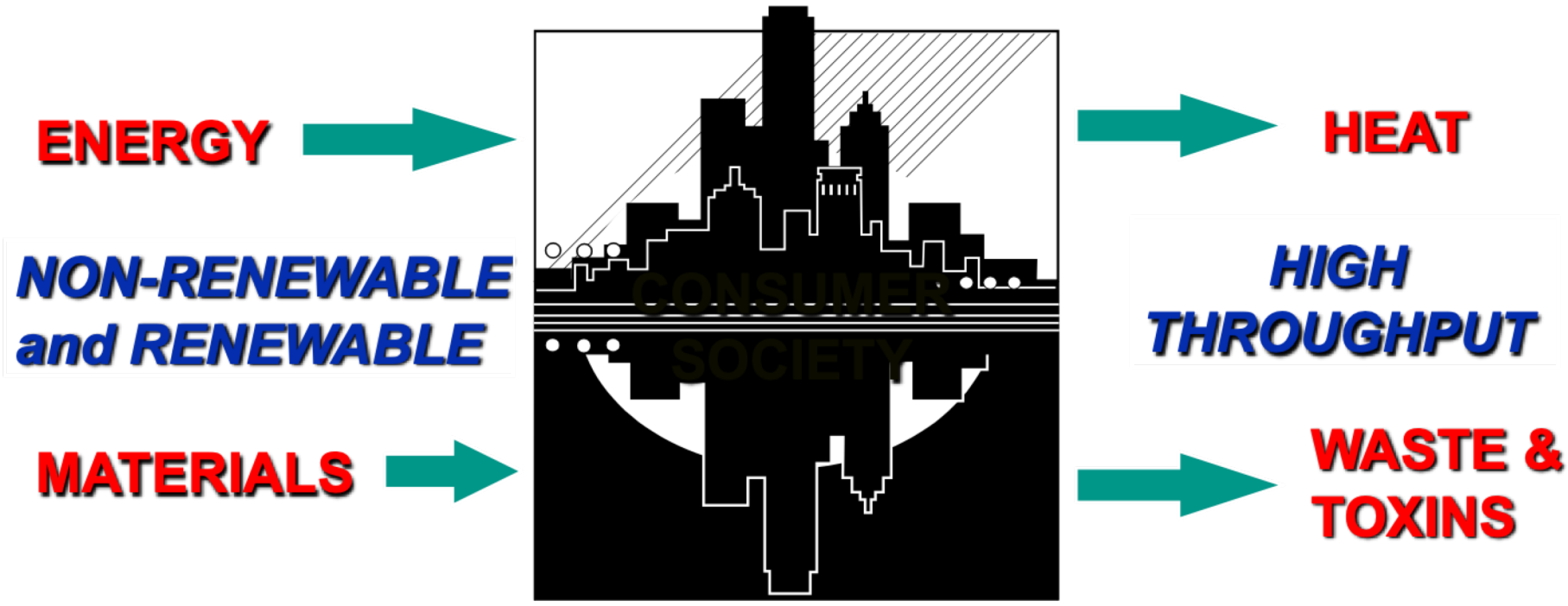
Need for Sustainability

Population growth rates contributes to *Environmental degradation* through over exploitation of natural resources. This change in ecosystem and degradation of the environment can only be sorted by *Sustainable Development*

A Version of the Natural Step Funnel



Obsolescent "Frontier" Civilization



One-way flow of materials and energy

Sustainable Civilization

ENERGY

RENEWABLE

MATERIALS

Energy Efficiency

Waste Minimization
Toxics control

Low-quality
Heat Energy

LOW
THROUGHPUT

Low-volume
Nontoxic
Waste
Materials

- *Cyclical flows of materials*
- *Appropriate energy usage*

Three Dimensions of Sustainability

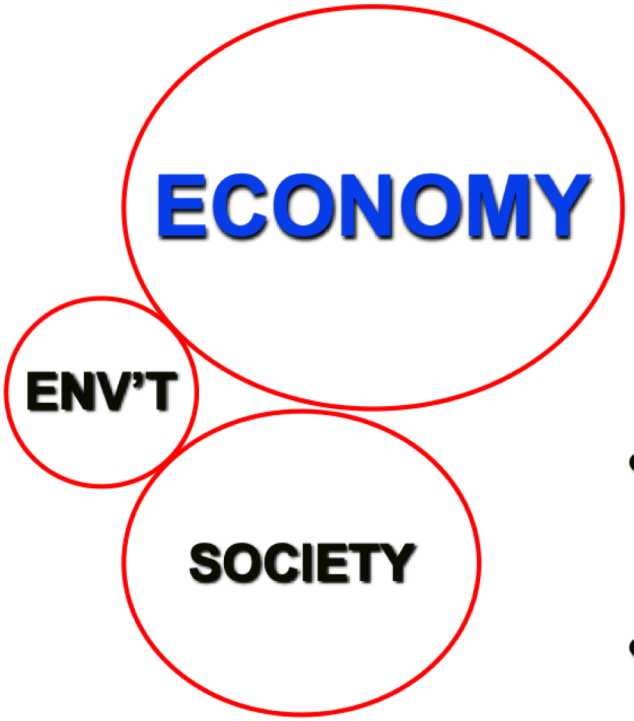
Scale

GLOBAL / MACRO

spatial	jurisdictional / decision making
earth	United Nations
continent	.
country	.
province	governments
region	.
municipality	.
neighbourhood	NGOs / community groups
household	.
individual	individuals

LOCAL / MICRO

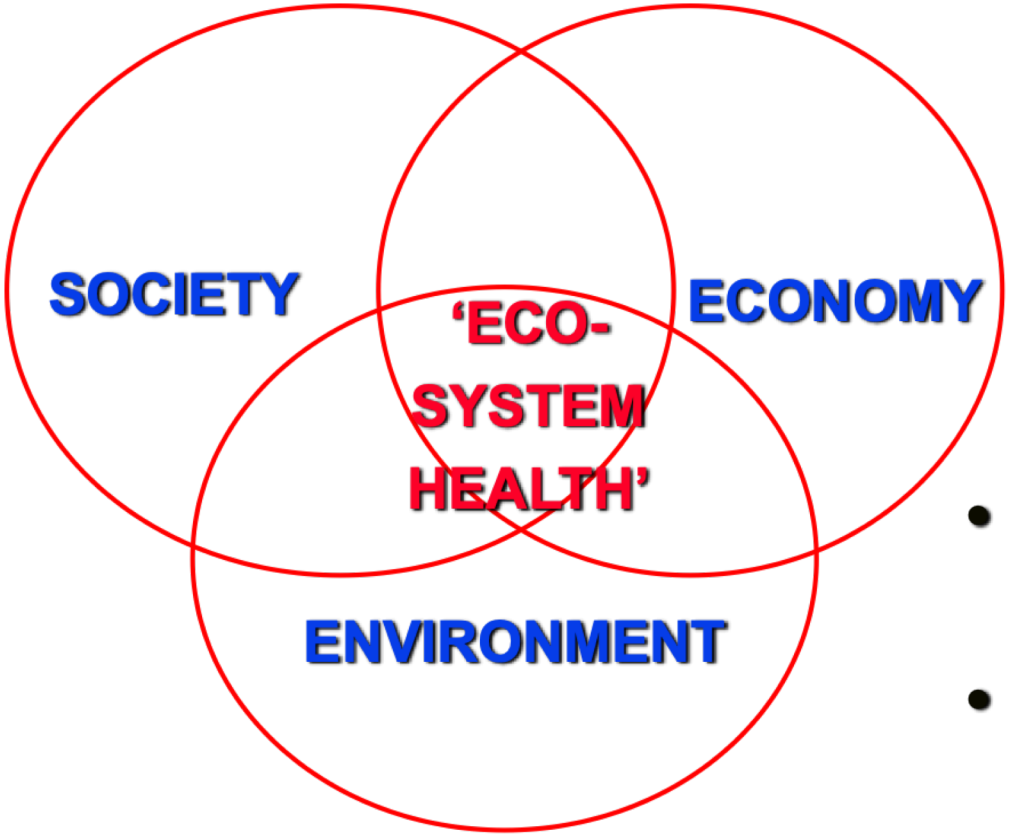
Sustainable Development: Decision Making



- ***NON-PARTICIPATORY***
- ***FRAGMENTED***

TRADITIONAL DECISION MAKING

Sustainable Development: Decision Making



- ***PARTICIPATORY***
- ***INTEGRATED***

ECOSYSTEM-BASED DECISION MAKING

Sustainable Development: Decision Making

Industry

• radical	• change in demand - less consumption - alternative consumption	• environment and economy and society
• anticipatory	• change in process - clean technology - elimination of toxics	• environment and economy
• reactive	• APCD/ STP/ ETP/ CETP - 'end of pipe' solution	• environment or economy

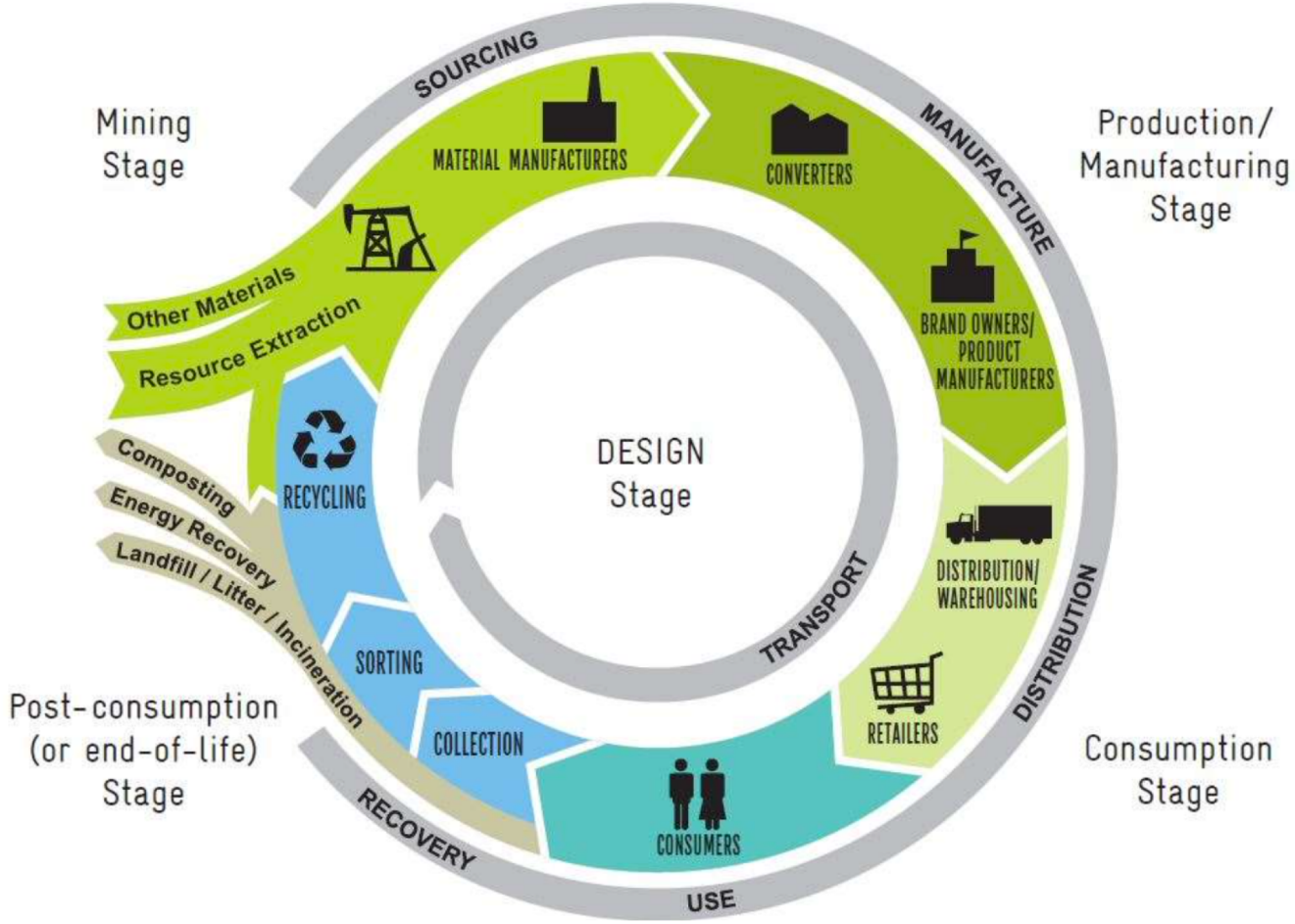
Sustainability: Problems

- **Depletion of finite resources**
  - fuels, soil, minerals, species
- **Over-use of renewable resources**
  - forests, fish & wildlife, fertility, public funds
- **Pollution**
  - air, water, soil
- **Inequity**
  - economic, political, social, gender
- **Species loss**
  - endangered species and spaces

- WCED, 1987

6Rs Principles

6Rs Principles: Refers to Reduce, Reuse, Recycle, Refurbish, Redesign and Remanufacture which are the keys for driving *resource efficiency*

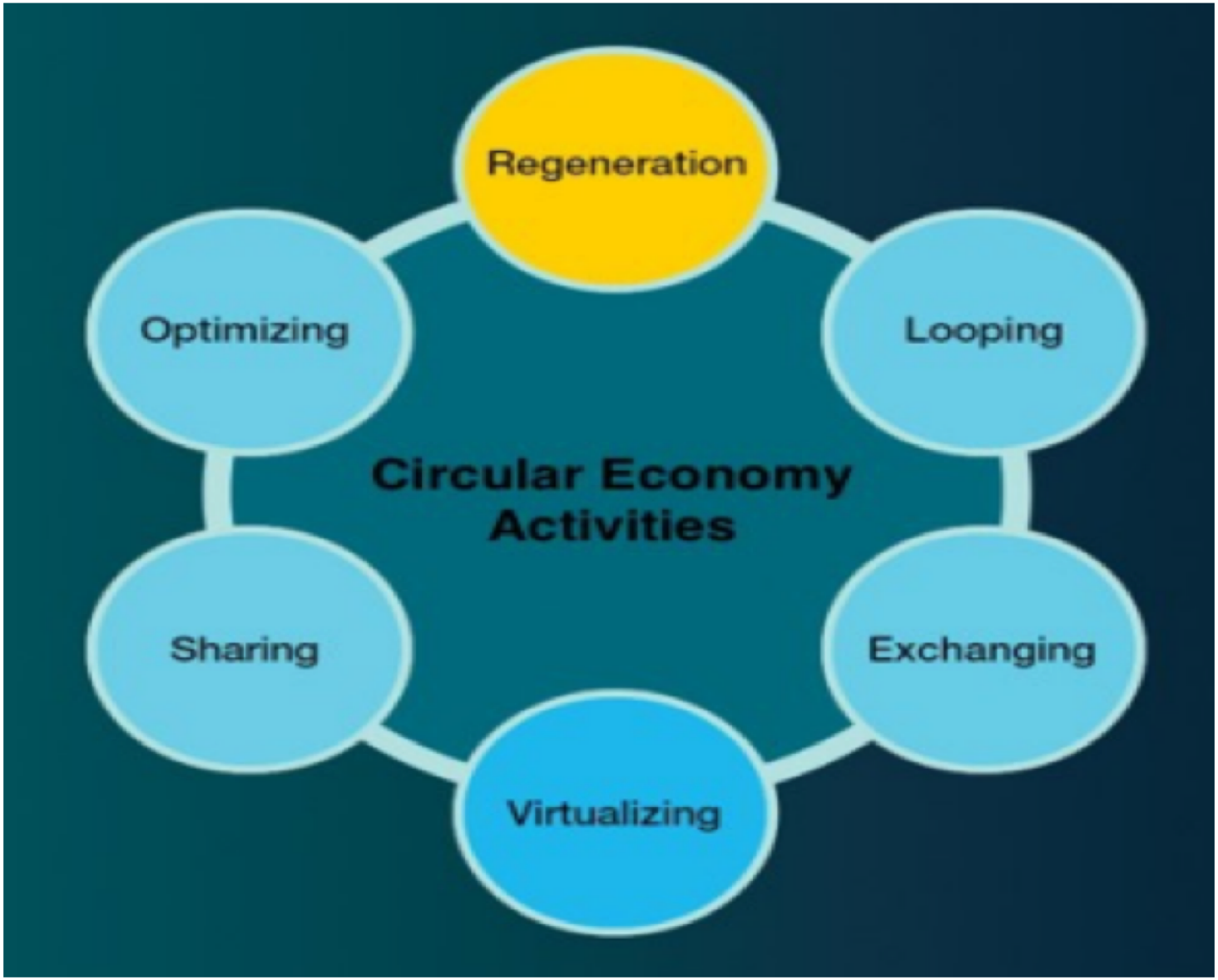


(Source:MoEFCC, 2018)

Circular Economy

- Circular economy (CE) revolves around a “system” that is based on *restorative and regenerative* principles.
- It is a shift from the traditional *'take-make-dispose'* models and offers sustainable modes for resource use and reutilization.
- The concept of waste is eliminated, and instead a continuous circulation of materials is envisaged.
- A circular system represents a systemic shift that builds resilience, creates business opportunities and jobs, enables communities and ensures good environmental performance.

Circular Economy (Cont.)



Sustainable Development Goals (SDGs)

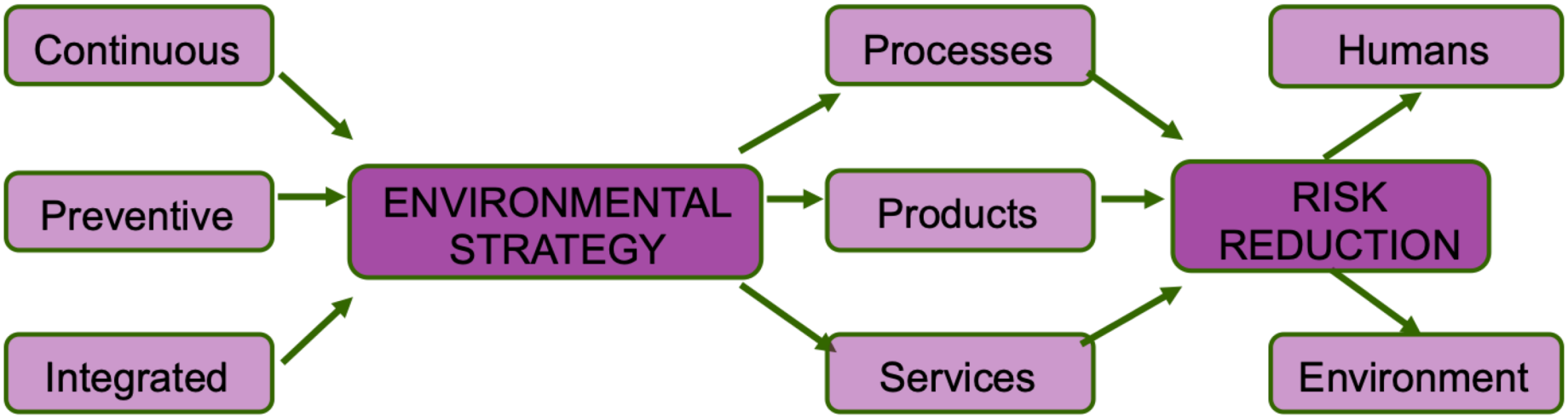
- Are the *global goals*
- Bruntland Commission Report, 1987 “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs”
- Adopted by the UN member states in *2015* as a universal call of action to end poverty, *protect the planet* and ensure that all people enjoy peace and prosperity *by 2030*
- The 17 SDGs are *integrated* which means that action in one area will affect the outcomes of other areas

Sustainable Development Goals (SDGs)

Cleaner Production: A Tool to Achieve SDGs

Definition by UNEP

" Cleaner Production is the continuous application of an integrated, preventive environmental strategy towards processes, products and services in order to increase overall efficiency and reduce damage and risks for humans and the environment."



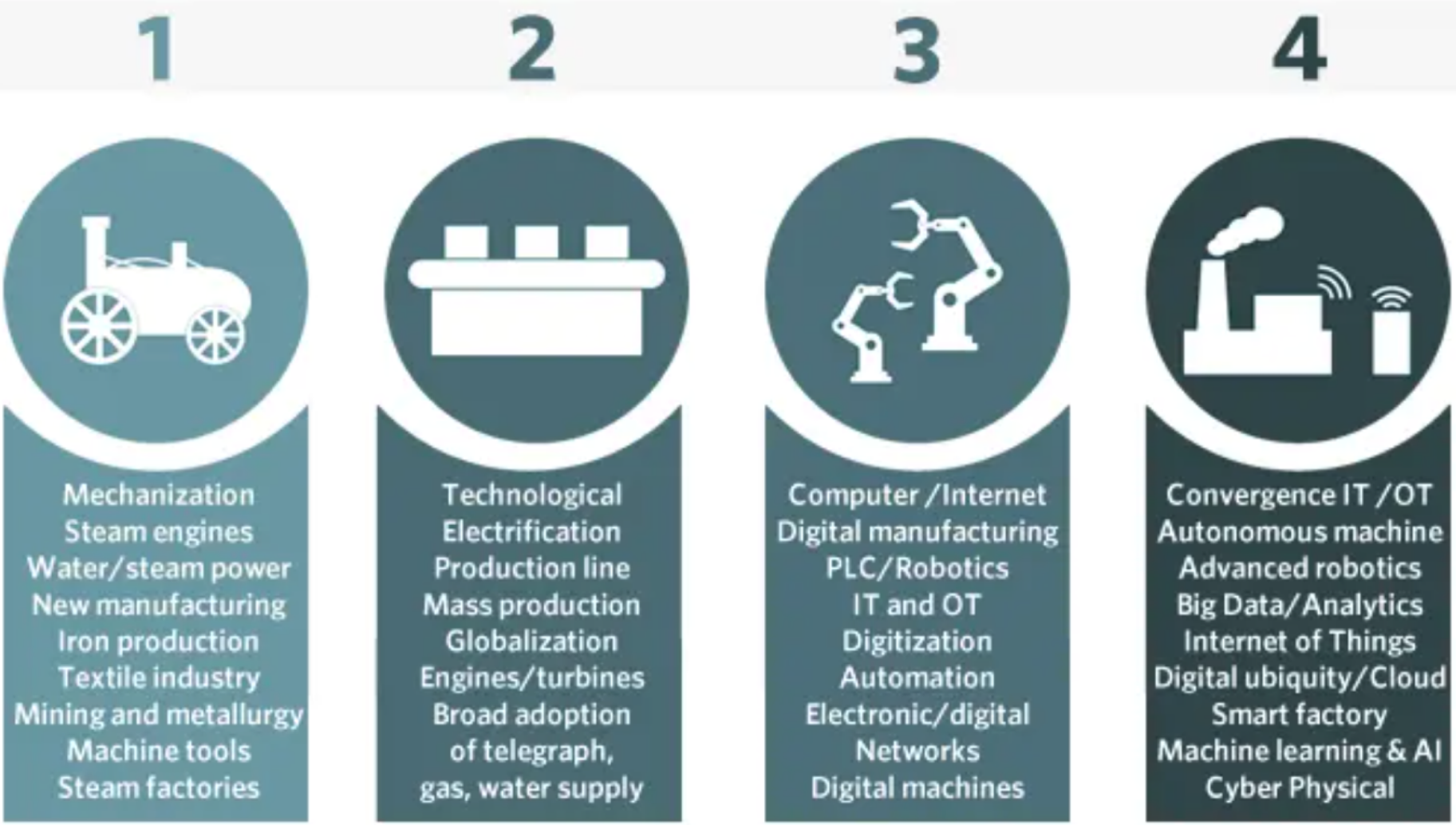
Basic Scheme of a CP Project

Industry 4.0

The term Industry 4.0 encompasses a promise of a new industrial revolution which refers to intelligent networking of machines and processes for industry with the help of information and communication technology, including:

Industry 4.0 (Cont.)

From Industry 4.0 to 4th Industrial Revolution




Thank You